

ERIOGONUM DIVARICATUM HOOK. (POLYGONACEAE),
AN INTERMOUNTAIN SPECIES IN ARGENTINA

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ABSTRACT.—*Eriogonum divaricatum*, an annual herb of clay slopes and flats in the Green and Colorado river drainage basin of the western United States, was found at the turn of the century in three locations in southern Argentina. The South American material was described in 1902 as a new species of *Eriogonum*, *E. ameghinoi* Speg., and this name was the basionym for a new monotypic genus, *Sanmartinia* M. Buchinger, proposed in 1950. The species has not been rediscovered in Argentina, and the presence of the species in South America was probably the result of a long-distance dispersal event involving shore birds.

With the publication of *Eriogonum ameghinoi* Speg. (Spegazzini 1902), *Eriogonum* Michx. (Polygonaceae), long considered restricted to Canada, United States, and Mexico, became defined as a taxon found in both North and South America. When Buchinger (1950) based the monotypic *Sanmartinia* on *E. ameghinoi*, *Eriogonum* was once again defined as endemic to North America. Other genera belonging to the subfamily Eriogonoideae are present in Chile and Argentina, namely *Chorizanthe* R. Br. ex Benth. (Goodman 1934), *Oxytheca* Nutt. (Erterter 1980), and *Lastarriaea* Remy (Goodman 1934). All are related to *Eriogonum* but differ in having barbed or otherwise armed involucre or tepals. This morphological feature has been suggested as the means for dispersal by animals from arid regions in western North America to similar areas in southern South America (Reveal 1978). I have proposed (Reveal 1978) two separate occasions of migration. The first involved the perennial species of *Chorizanthe* now found in South America that came from the then perennial members of the genus in North America (now extinct in the north and replaced by annual species). The second migration that occurred probably happened much later (probably during the Pleistocene), and this resulted in the introduction of an array of annual species into South America, notably *O. dendroidea* Nutt. ssp. *chiliensis* (Remy) Erterter, *C. commissuralis* Remy, and probably *L. chiliensis* Remy. In each of these

cases, the migration was a success and colonization occurred.

My own views regarding *Sanmartinia* have been largely masked in ignorance of the exact nature of the material. In my doctoral dissertation (Reveal 1969), *Eriogonum ameghinoi* was excluded from the genus and placed in *Sanmartinia*. This view persisted until publication of the excellent paper by Moreau and Crespo (1969). They noted that the supposed lack of an involucre, as suggested by I. M. Johnston on an annotation attached to one of the Ameghino specimens, badly misled Buchinger, and the species was not representative of a new genus but a typical species of *Eriogonum*.

Unfortunately, Moreau and Crespo had access only to Abrams (1944) as a means of comparison of the Argentinian material with North American species. When J. T. Howell of the California Academy of Sciences called my attention to their paper in 1970, I came to the conclusion, based on their illustration (as well as Buchinger's plate) that *E. ameghinoi* was probably a synonym of *E. divaricatum* Hook. This point was reinforced by Moreau and Crespo's observation that a five-parted involucre was present as Spegazzini (1902) had stated, and not lacking as Johnston had implied.

Eriogonum divaricatum is an annual herb found often on gumbo clay hills and flats in the Colorado and Green river drainage basin of southwestern Wyoming southward

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through eastern Utah and adjacent western Colorado into northwestern New Mexico and northern Arizona (Reveal 1973, 1976). It is also on the northern shore of Sevier Lake, Millard Co., western Utah (Reveal & Reveal 4001). This reduction of *Sanmartinia* and *E. ameghinoi* to *E. divaricatum* was suggested by Reveal and Howell (1976) in the key to genera of the subfamily Eriogonoideae and later repeated in more detail in a review of the subfamily (Reveal 1978); however, in both instances this was done based solely upon observations of illustrations and not the actual examination of the specimens.

Two of the collections of *Eriogonum ameghinoi* (both at LP) have been made available for study (a third is at BA, fide Moreau and Crespo [1969]). These two specimens were *Ameghino 11317* from Lago Colhue-Huapi, Dpto. Sarmiento, Chubut, Argentina, gathered in 1900, and *Ameghino 11318* from between San Julian and Río Deseado, collected in 1899. The first collection, the more mature of the two, and the one on which Spegazzini (1902) based his description, is here selected as the lectotype for the species. The nearly complete specimen in the upper left-hand corner of the lectotype served as the basis for the illustration in both Buchinger (1950) and Moreau and Crespo (1969). This collection was gathered near a large, inland lake located west-northwest of Comodoro Rivadavia in southeastern Chubut. The second collection came from an unknown location somewhere between Río Deseado and San Julian. This is an arid region dotted with occasional lakes, but the distance between the two reference points is nearly 300 km, and it is impossible to determine where the collection was made. The third specimen (not seen by me) was gathered at Deseado, a small town on the Atlantic coast near the mouth of Río Deseado. The last two collections came from eastern Santa Cruz.

In the intervening years *Eriogonum divaricatum* has not been recollected in South America. That it was relatively widespread is shown by the three separate sites where it was collected, a distance of perhaps 400 km north-south. Although it is likely that Ameghino selectively collected sites where the *Eriogonum* might be found, that he found it and no one else has may be due to a series of

unique events that have not been subsequently repeated.

Eriogonum divaricatum occurs in heavy clay soil that tends to clump when wetted. In some years in eastern Utah, great masses of annual *Eriogonum* species will be found in flower. This is particularly true of *E. inflatum* Torr. & Frém. var. *fusiforme* (Small) Reveal, but will occasionally happen in such species as *E. scabrellum* Reveal, *E. subreniforme* S. Wats., *E. wetherillii* Eastw., both species of the genus *Stenogonum* Nutt. (see Reveal and Ertter 1977), and even *E. divaricatum*. Unlike most of these species, *E. divaricatum* is in full fruit during the early fall of the year. By this time the other annuals have dropped their seeds, or, in the case of *E. scabrellum*, will not be in full fruit until late in the fall.

The distribution of *Eriogonum divaricatum* is relatively widespread in the Intermountain West, occurring, as noted above, from Wyoming to New Mexico and Arizona. Within such a large area it would normally be difficult to determine where the South American plants came from were it not for minor populational differences in the floral hair morphology associated with the tepals of *E. divaricatum*. The hairs of the South American plants are long, slender, smooth, and pointed at the tip on mature tepals. The hairs on tepals from plants gathered in northern Arizona, western Utah, and southeastern Utah are short, bulbous apically, smooth, and rounded at the tip. Hairs of other plants gathered in northern Arizona and eastern Utah are similar to those of the South American plants except that the shaft of the hair is slightly papillose and not smooth. An examination of floral hairs from plants gathered in scattered portions of northeastern Arizona most closely resemble the hairs of the South American plant, with those found on an Eastwood and Howell collection (6497-US) gathered near Cameron, Coconino Co., being the most similar.

Because *Eriogonum divaricatum* is common along major waterways in this part of Arizona, and elsewhere in its range, and these waterways are heavily visited by migratory birds, I suspect that the introduction of *E. divaricatum* into portions of Argentina located precisely at the southern end of a

major north-south flyway (see National Geographic Map, "Bird Migration in the Americas," Aug. 1979) was accomplished by migrating birds. It is unlikely that seeds of the *Eriogonum* were eaten but not digested and passed in a viable state. Rather, it is more likely that seeds were attached to birds, probably on mud-caked feathers, and carried passively to South America. Only a few groups of birds have this extended pattern of distribution, and one of them is the shore bird. Of the several species that are found in the Intermountain West, e.g., *Bartramia longicauda* (Upland Plover), *Tringa solitaria cinuamoma* (Western Solitary Sandpiper), and *Totanus flavipes* (Yellow-legs), among others (Bailey 1928, Hayward et al. 1977), only one, *Totanus flavipes*, is common throughout the area where the *Eriogonum* occurs in Argentina (Olrog 1968). Interestingly, this species, as with other shore birds, is capable of flying the entire distance from Utah and Arizona to South America nonstop (J. W. Aldrich, pers. comm.).

Why *Eriogonum divaricatum* has not been relected in Argentina cannot be determined, but that fact alone should not exclude the possibility that the species is not still extant in the country. If extirpated, however, some consideration can be given to the introduction of *E. divaricatum* into Argentina as a single, unique event. If there was a large population of *E. divaricatum*, say in northeastern Arizona, that was fed upon at the same time by numerous birds, and by some remarkable event seeds ended up in Argentina in different places, germinated, and grew and plants were fortuitously collected by a botanist during the one growing season that the plants were extant, this would have been astonishing.

It is possible that *Eriogonum divaricatum* persisted in Argentina for several thousands of years. The floral hair differences are admittedly slight but do indicate a slight degree of divergency that could be associated with isolation (see Grant [1967] for an example in *Gilia*). The length of time that that divergency may have had to develop is another matter. As Raven (1963) has pointed out, the timing of the various migration events into South America from North America is still confusing, and, though I feel (Reveal 1978)

the introduction of *E. divaricatum* occurred during the Quaternary, I cannot state for certain when. If the plants persisted for only a few years after their initial introduction, and during one of the growing seasons Ameghino found them and made collections, then the species might never have truly become established. If the species was extirpated naturally after Ameghino collected the plants, the events associated with the extirpation will never be ascertained. If the buckwheat was recently introduced, as a result of a one-chance event, then its extirpation might have been just as sudden.

ACKNOWLEDGMENTS

I thank Dr. Angel L. Cabrera and the staff at the Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, for making the specimens of *Eriogonum ameghinoi* available, and Dr. J. W. Aldrich, Department of Ornithology, National Museum of Natural History, Smithsonian Institution, Washington, D.C., for his help with determining bird species that might be responsible for the distribution of *Eriogonum* in South America. Dr. John L. Strother kindly reviewed and commented upon a draft of the manuscript.

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